Laser Communications Relay Demonstration (LCRD)

Completed Technology Project (2011 - 2021)

Project Introduction

LCRD is a minimum two year flight demonstration in geosynchronous Earth orbit to advance optical communications technology toward infusion into Deep Space and Near Earth operational systems, while growing the capabilities of industry sources. LCRD will validate the essential operational elements of an optical communication network and establish the initial operational capability for the next generation of satellites. The LCRD mission will provide a minimum of two years of continuous high rate optical communications in an operational environment and demonstrate a viable operational architecture for laser communication. Optical communications will enable NASA to undertake future complex missions that would require large increases in data volume with minimum impact to the user for accommodation of the communication system. LCRD will demonstrate the modulation and coding suitable for very high rate links. The LCRD architecture enables it to serve as a test bed to demonstrate advanced networking concepts and protocols that will enable full potential operational optical communications for future missions.

Anticipated Benefits

A reliable, capable, and cost effective optical communication technology for infusion into operational systems. Optical systems provide significantly increased data rates or reduced power. Provides on orbit test bed for both deep space and near earth optical communication mission scenarios through collaboration of NASA with other US agencies. Project helps to develop industry sources for space optical communication systems. Demo & validate a reliable, capable, and cost effective optical communications technology for infusion into operational systems.

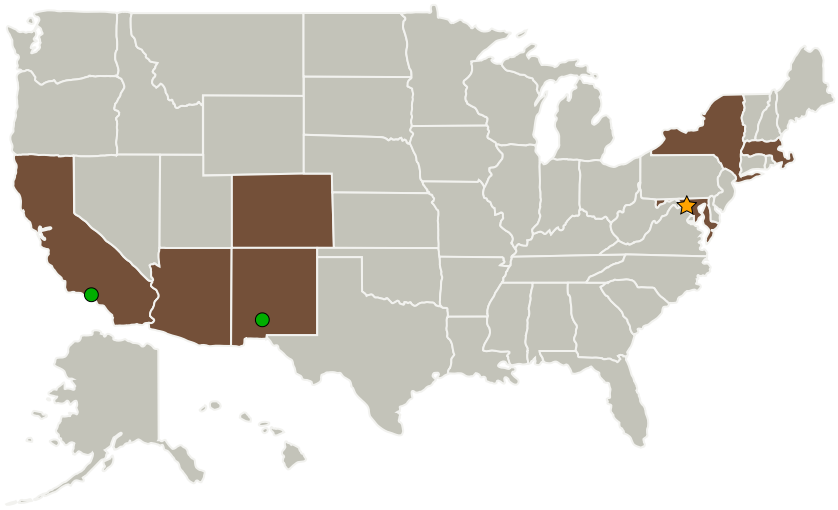
The Laser Communications Relay Demonstration mission proposes to revolutionize the way we send and receive data, video and other information, using lasers to encode and transmit data at rates 10 to 100 times faster than today's faste…

Table of Contents

Laser Communications Relay Demonstration (LCRD)

Completed Technology Project (2011 - 2021)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Air Force Space Test Program	Supporting Organization	US Government	Kirtland AFB, New Mexico
●Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California
Massachusetts Institute of Technology Lincoln Laboratory(MIT-LL)	Supporting Organization	R&D Center	Lexington, Massachusetts
Orbital ATK Space Systems Group	Supporting Organization	Industry	Dulles, Virginia
●White Sands Test Facility(WSTF)	Supporting Organization	NASA Facility	Las Cruces, New Mexico

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Technology Demonstration Missions

Project Management

Program Director:

Trudy F Kortes

Program Manager:

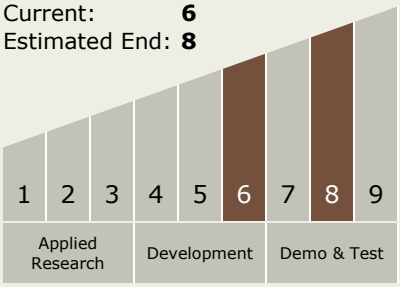
Tawnya P Laughinghouse

Project Manager:

Glenn B Jackson

Technology Maturity (TRL)

Start: **6**
Current: **6**
Estimated End: **8**



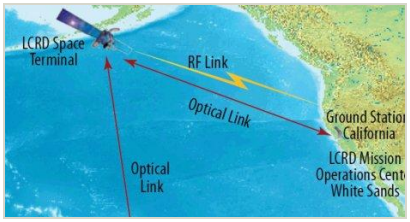
Laser Communications Relay Demonstration (LCRD)

Completed Technology Project (2011 - 2021)

Co-Funding Partners	Type	Location
Space Communications and Navigation(SCaN)	NASA Program	
Space Technology Mission Directorate(STMD)	NASA Mission Directorate	

Primary U.S. Work Locations	
Arizona	California
Colorado	Maryland
Massachusetts	New Mexico
New York	

Images



15112.jpg
Project Image Laser Communications Relay Demonstration (LCRD)
(https://techport.nasa.gov/image/100853)

4795-1390849155521.jpg
Laser Communications Relay Demonstration (LCRD)
(https://techport.nasa.gov/image/100852)

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.1 Optical Communications
    - TX05.1.3 Lasers

Target Destinations

Earth, The Moon

Supported Mission Type

Push

Laser Communications Relay Demonstration (LCRD).jpg
The Laser Communications Relay Demonstration mission proposes to revolutionize the way we send and receive data, video and other information, using lasers to encode and transmit data at rates 10 to 100 times faster than today's fastest radio-frequency systems, using significantly less mass and power.
(https://techport.nasa.gov/image/100851)

LCRD Rendering
The Laser Communications Relay Demonstration payload is attached to the LCRD Support Assembly Flight (LSAF), which can be seen in this image. The LSAF serves as the backbone for the LCRD components. Attached to the LSAF are the two optical modules, which generate the infrared lasers that transmit data to and from Earth. A star tracker is also attached here. These components are visible on the left side of this image. Other LCRD components, such as the modems that encode data into laser signals, are attached to the back of the LSAF. Credits: NASA's Goddard Space Flight Center
(https://techport.nasa.gov/image/100854)

Links

LCRD installed onto spacecraft in preparation for launch
(https://www.nasa.gov/feature/goddard/2020/nasa-s-next-laser-communications-demo-installed-integrated-on-spacecraft)

LCRD Moves Northrup Grumman facility for spacecraft integration
(https://www.nasa.gov/feature/goddard/2020/nasa-s-laser-communications-relay-demonstration-mission-leaves-goddard-space-flight-ce)

Project Website:

https://www.nasa.gov/mission_pages/tdm/lcrd/index.html